

# NASA TECH BRIEF



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## Technique for Abrasive Cutting of Thick-Film Conductors for Hybrid Circuits

### The problem:

Fabricating microcircuit prototypes in the laboratory without requiring screening and fixing procedures.

### The solution:

An abrasive jet technique used to produce prototype conductor networks for thick-film hybrid microcircuits. This technique uses a pantograph engraver to perform abrasive cutting of the conductor network.

### How it's done:

The abrasive cutting operation is performed by adapting the nozzle of a thick-film resistor trimmer to the spindle of a pantograph. Cutting parameters are 80-psi pressure, a nozzle tip distance of approximately 0.015-inch and a powder flow of about 10 grams per minute. Cutting time for each network is less than 20 minutes.

A cleaning process is necessary to remove all traces of the powder before assembly. It is recommended that tweezers be used when handling the units. Subsequent to ultrasonic cleaning the components are bonded to the substrate and the wire interconnections are made by conventional methods. The final operation before testing is trimming of the resistor chips.

The estimated cost of this facility is less than \$15,000; equipment required includes: a pantograph, a thick-film resistor trimmer, and a chip-and-wire bonder. A conventional facility set-up for producing hybrid thick-film microcircuits would cost in excess

of \$50,000.

### Notes:

1. The technique described in this NASA Tech Brief is unique in that it is used to fabricate microcircuit prototypes. The value of this technique is that it permits laboratory fabrication of prototype designs without screening and fixing procedures. The process discussed should be of interest to individuals associated with electronic laboratories, electronic design, and microcircuit research.
2. There remain many areas of investigation, e.g., crossover capability, optimum bonding methods, protective coatings, etc., before the abrasive circuit process can be thoroughly evaluated.
3. Documentation is available from:  
Clearinghouse for Federal Scientific  
and Technical Information  
Springfield, Virginia 22151  
Price \$3.00  
Reference: TSP69-10235

### Patent status:

No patent action is contemplated by NASA.  
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